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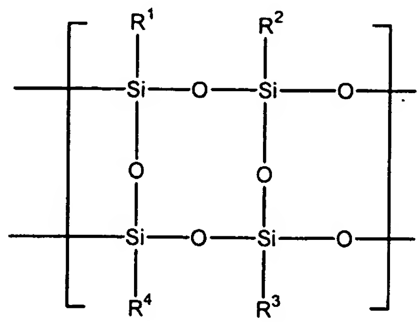
67. A fluorinated silsesquioxane polymer comprised of monomer units having the structure (I)

(I)



wherein:

R^1, R^2, R^3 and R^4 are independently selected from the group consisting of substituents having a terminal $-CR^7R^8R^9$ group;

R^7 is hydrogen, alkyl, or fluoroalkyl;

R^8 is fluoroalkyl; and

R^9 is OH, COOH or an acid-cleavable moiety.

68. The polymer of claim 67, wherein R^1, R^2, R^3 and R^4 are independently selected from the group consisting of substituents having the structure of formula (II)

(II) $$-(Q)_n-CR^7R^8R^9$$

wherein n is zero or 1.

69. The polymer of claim 68, wherein Q is selected from the group consisting of substituted and unsubstituted arylene, substituted and unsubstituted cycloalkylene, and C_1-C_4 alkylene optionally substituted with at least one nonhydrogen substituent selected from alkyl and fluoroalkyl.

70. The polymer of claim 69, wherein Q is fluorinated.

71. The polymer of claim 69, wherein Q is selected from the group consisting of arylene, fluorinated arylene, cycloalkylene, fluorinated cycloalkylene, and C_1-C_4 alkylene optionally substituted with 1-8 nonhydrogen substituents selected from alkyl and fluoroalkyl.

72. The polymer of claim 71, wherein Q is selected from the group consisting of arylene, fluorinated arylene, cycloalkylene, and fluorinated cycloalkylene.

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73. The polymer of claim 72, wherein Q is arylene or fluorinated arylene.

74. The polymer of claim 73, wherein Q is bicyclic.

75. The polymer of claim 73, wherein Q is arylene.

76. The polymer of claim 73, wherein Q is fluorinated arylene.

77. The polymer of claim 72, wherein Q is cycloalkylene.

78. The polymer of claim 72, wherein Q is fluorinated cycloalkylene.

79. The polymer of claim 71, wherein Q is C_1-C_4 alkylene optionally substituted with 1-8 nonhydrogen substituents selected from alkyl and fluoroalkyl.

80. The polymer of claim 79, wherein Q is C_1-C_4 alkylene optionally substituted with 1-8 nonhydrogen substituents selected from C_1-C_6 alkyl and C_1-C_6 fluoroalkyl.

81. The polymer of claim 79, wherein Q is C_1-C_4 alkylene optionally substituted with 1-8 nonhydrogen substituents selected from C_1-C_6 alkyl, trifluoromethyl, and trifluoromethyl-substituted C_1-C_6 alkyl.

82. The polymer of claim 67, wherein R^7 is hydrogen, C_1-C_6 alkyl, or C_1-C_6 fluoroalkyl.

83. The polymer of claim 67, wherein R^7 is hydrogen, C_1-C_6 alkyl, trifluoromethyl, or trifluoromethyl-substituted C_1-C_6 alkyl.

84. The polymer of claim 67, wherein R^8 is C_1-C_6 fluoroalkyl.

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85. The polymer of claim 83, wherein R^8 is trifluoromethyl-substituted C_1-C_6 alkyl.

86. The polymer of claim 67, wherein R^9 is OH.

87. The polymer of claim 67, wherein R^9 is COOH.

88. The polymer of claim 67, wherein R^9 is an acid-cleavable moiety.

89. The polymer of claim 88, wherein the acid-cleavable moiety is an acid-cleavable ester, ether or carbonate.

90. The polymer of claim 89, wherein R^9 is an acid-cleavable ester.

91. The polymer of claim 90, wherein R^9 has the formula $-(L)_v-(CO)-OR^{14}$ wherein v is zero or 1, L is a linking group, and R^{14} is selected from the group consisting of tertiary alkyl moieties, cyclic or alicyclic substituents with a tertiary attachment point, and 2-trialkylsilylethyl moieties.

92. The polymer of claim 91, wherein v is zero and R^{14} is tertiary alkyl.

93. The polymer of claim 92, wherein R^{14} is *t*-butyl.

94. The polymer of claim 91, wherein v is zero and R^{14} is a cyclic or alicyclic substituent with a tertiary attachment point.

95. The polymer of claim 94, wherein R^{14} is selected from the group consisting of adamantyl, norbornyl, isobornyl, 2-methyl-2-adamantyl, 2-methyl-2-isobornyl, 2-butyl-2-adamantyl, 2-propyl-2-isobornyl, 2-methyl-2-tetracyclododecenyl, 2-methyl-2-dihydrodicyclopentadienyl-cyclohexyl, 1-methylcyclopentyl, 1-methylcyclohexyl, 2-trimethylsilylethyl, and 2-triethylsilylethyl.

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96. The polymer of claim 91, wherein v is zero and R^{14} is 2-trialkylsilylethyl.

97. The polymer of claim 96, wherein R^{14} is 2-trimethylsilylethyl.

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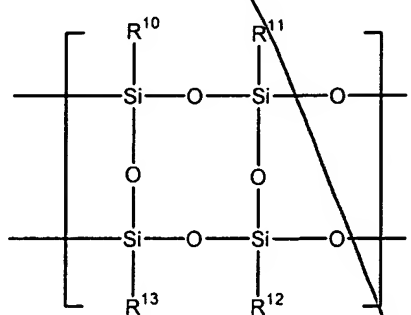
98. The polymer of claim 96, further comprising additional monomer units having the structure of formula (IV)

(IV)



wherein R^{10}, R^{11}, R^{12} and R^{13} are independently hydrogen, alkyl, fluoroalkyl, fluorocarbinol or an acid-cleavable moiety, with the proviso that at least one of R^{10}, R^{11}, R^{12} and R^{13} is an acid-cleavable moiety.

99. The polymer of claim 98, wherein at least one of R^{10}, R^{11}, R^{12} and R^{13} is selected from the group consisting of acid-cleavable esters, ethers, and carbonates.

100. The polymer of claim 99, wherein at least one of R^{10}, R^{11}, R^{12} and R^{13} is an acid-cleavable ester.

101. A lithographic photoresist composition comprising the fluorinated silsesquioxane polymer of claim 67 and a radiation-sensitive acid generator.

102. A lithographic photoresist composition comprising the fluorinated silsesquioxane polymer of claim 98 and a radiation-sensitive acid generator.

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103. The lithographic photoresist composition of claim 101, wherein the photoresist composition is a positive resist and further comprises a photoacid-cleavable dissolution inhibitor.

104. The lithographic photoresist composition of claim 102, wherein the photoresist composition is a positive resist and further comprises a photoacid-cleavable dissolution inhibitor.

105. The lithographic photoresist composition of claim 101, wherein the photoresist composition is a negative resist and further comprises a crosslinking agent.

106. The lithographic photoresist composition of claim 102, wherein the photoresist composition is a negative resist and further comprises a crosslinking agent.

107. The lithographic photoresist composition of claim 105, wherein the crosslinking agent is a glycoluril compound.

108. The lithographic photoresist composition of claim 107, wherein the glycoluril compound is selected from the group consisting of tetramethoxymethyl glycoluril, methylpropyltetramethoxymethyl glycoluril, methylphenyltetramethoxymethyl glycoluril, and mixtures thereof.

109. The lithographic photoresist composition of claim 106, wherein the crosslinking agent is a glycoluril compound.

110. The lithographic photoresist composition of claim 109, wherein the glycoluril compound is selected from the group consisting of tetramethoxymethyl glycoluril, methylpropyltetramethoxymethyl glycoluril, methylphenyltetramethoxymethyl glycoluril, and mixtures thereof.

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111. A process for generating a resist image on a substrate, comprising the steps of:

(a) coating a substrate with a film of the photoresist composition of claim 101;

(b) exposing the film selectively to a predetermined pattern of deep ultraviolet radiation so as to form a latent, patterned image in the film; and

(c) developing the latent image with a developer.

112. The process of claim 111, wherein the deep ultraviolet radiation has a wavelength of less than 250 nm.

113. The process of claim 112, wherein the deep ultraviolet radiation has a wavelength of 157 nm.

114. The process of claim 111, wherein the substrate is a bilayer substrate comprising a base layer covered by an underlayer and the photoresist composition covers the underlayer.

115. A process for generating a resist image on a substrate, comprising the steps of:

(a) coating a substrate with a film of the photoresist composition of claim 102;

(b) exposing the film selectively to a predetermined pattern of deep ultraviolet radiation so as to form a latent, patterned image in the film; and

(c) developing the latent image with a developer.

116. The process of claim 115, wherein the deep ultraviolet radiation has a wavelength of less than 250 nm.

117. The process of claim 116, wherein the deep ultraviolet radiation has a wavelength of 157 nm.

118. The process of claim 115, wherein the substrate is a bilayer substrate comprising a base layer covered by an underlayer and the photoresist composition covers the underlayer.

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119. A method of forming a patterned material structure on a substrate, comprising:

(a) providing a substrate comprised of a material selected from the group consisting of semiconductors, ceramics and metals;

(b) applying a layer of the photoresist composition of claim 103 to the substrate;

(c) patternwise exposing the substrate to radiation whereby acid is generated by the radiation-sensitive acid generator in exposed regions of the photoresist layer;

(d) contacting the substrate with an aqueous alkaline developer solution, whereby the exposed regions of the photoresist layer are selectively dissolved by the developer solution to reveal a resist structure pattern; and

(e) transferring the resist structure pattern to the substrate by etching into the substrate through spaces in the resist structure pattern.

120. The process of claim 119, wherein the radiation is deep ultraviolet radiation.

121. A method of forming a patterned material structure on a substrate, comprising:

(a) providing a substrate comprised of a material selected from the group consisting of semiconductors, ceramics and metals;

(b) applying a layer of the photoresist composition of claim 104 to the substrate;

(c) patternwise exposing the substrate to radiation whereby acid is generated by the radiation-sensitive acid generator in exposed regions of the photoresist layer;

(d) contacting the substrate with an aqueous alkaline developer solution, whereby the exposed regions of the photoresist layer are selectively dissolved by the developer solution to reveal a resist structure pattern; and

(e) transferring the resist structure pattern to the substrate by etching into the substrate through spaces in the resist structure pattern.

122. The process of claim 119, wherein the radiation is deep ultraviolet radiation.

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123. A method of forming a patterned material structure on a substrate, comprising:

(a) providing a substrate comprised of a material selected from the group consisting of semiconductors, ceramics and metals;

(b) applying a layer of the photoresist composition of claim 105 to the substrate

(c) patternwise exposing the substrate to radiation whereby acid is generated by the radiation-sensitive acid generator in exposed regions of the photoresist layer thereby inducing crosslinking;

(d) contacting the substrate with an aqueous alkaline developer solution, whereby the unexposed regions of the photoresist layer are selectively dissolved by the developer solution to reveal a negative resist structure pattern; and

(e) transferring the negative resist structure pattern to the substrate by etching into the substrate through spaces in the negative resist structure pattern.

124. A method of forming a patterned material structure on a substrate, comprising:

(a) providing a substrate comprised of a material selected from the group consisting of semiconductors, ceramics and metals;

(b) applying a layer of the photoresist composition of claim 106 to the substrate

(c) patternwise exposing the substrate to radiation whereby acid is generated by the radiation-sensitive acid generator in exposed regions of the photoresist layer thereby inducing crosslinking;

(d) contacting the substrate with an aqueous alkaline developer solution, whereby the unexposed regions of the photoresist layer are selectively dissolved by the developer solution to reveal a negative resist structure pattern; and

(e) transferring the negative resist structure pattern to the substrate by etching into the substrate through spaces in the negative resist structure pattern.